DOI: https://doi.org/10.54393/pjhs.v5i12.2494

PAKISTAN JOURNAL OF HEALTH SCIENCES
(LAHORE)
https://thejas.com.pk/index.php/pjhs
ISSN (P): 2790-9352, (E): 2790-9344
Volume 5, Issue 12 (Deccember 2024)

Original Article

OPEN ACCESS

Prevention and Control of Cervical Cancer by WHO-Endorsed Guidelines for Visual Inspection with Acetic Acid (Via) As a Simple Screening Method

Sania Ratyal[1*], Shazia Saeed[1], Nasreen Hameed[1], Sara Akram[1], Maryam Sabir Khan[1] and Ayesha Fatima[1]

[1]Department of Gynecology and Obstetrics, Divisional Headquarter Teaching Hospital, Mirpur, Pakistan

ARTICLE INFO

Keywords:
Cervical Cancer, Acetic Acid, Diagnostic Accuracy, Visual Inspection

How to Cite:
Ratyal, S., Saeed, S., Hameed, N., Akram, S., Sabir Khan, M., & Fatima, A. (2024). Prevention and Control of Cervical Cancer by WHO-Endorsed Guidelines for Visual Inspection with Acetic Acid (Via) as a Simple Screening Method: Prevention and Control of Cervical Cancer. Pakistan Journal of Health Sciences, 5(12), 81-86. https://doi.org /10.5439 3/pjhs .v5i12.2494

Corresponding Author:
Sania Ratyal
Department of Gynecology and Obstetrics, Divisional Headquarter Teaching Hospital, Mirpur, Pakistan
saaniaishtiaq.si@gmail.com

Received date: 2nd November, 2024
Accepted date: 20th December, 2024
Published date: 31st December, 2024

ABSTRACT

Despite the availability of primary prevention through Human Papillomavirus (HPV) vaccination, cervical cancer remains one of the leading causes of cancer-related deaths among women worldwide. And imposes an enormous global public health burden most notably for those living in low- or middle-income countries. **Objective:** To determine the diagnostic accuracy of VIA in diagnosing cervical cancer as compared to conventional methods. **Methods:** This retrospective study analyzed a cohort of women who underwent VIA screening for cervical cancer at Divisional Headquarters Teaching Hospital. The sample included 1,200 women aged 25-65 who had not been screened for cervical cancer in the previous three years. VIA screening followed WHO-recommended procedures, with presumptive diagnoses made through naked eye examination based on WHO guidelines for low-resource settings. Data was entered and analyzed by SPSS 25.0. **Results:** Among 1,200 women screened for cervical abnormalities using VIA, 280 tested positive (23.3%). The highest VIA-positive rates were in the 45-54 age group (112 positives), followed by the 35-44 group (70 positives). The diagnostic accuracy of VIA for cervical abnormalities shows high sensitivity (89.34%) and specificity (96.23%). VIA's positive predictive value was 85.83%, while the negative predictive value was 97.25%, indicating reliable detection of true positives and negatives. **Conclusions:** VIA was an accurate, affordable screening tool with a high level of sensitivity and specificity in detecting cervical precancerous lesions, particularly for low-resource settings. These results highlight the effectiveness of VIA screening across age groups, with higher detection rates in women over 35.

INTRODUCTION

The primary prevention with Human Papillomavirus (HPV) vaccination, cervical cancer is still one of the leading causes of death from any type in women worldwide and imposes an enormous global public health burden most notably for those living in low- or middle-income countries [1]. In fact, the incidence and mortality rates due to cervical cancer are grossly higher in Low- and Middle-Income Countries (LMICs). Because of poor access to cost-effective preventive measures viz. screening services supplemented with effective treatment options [2]. Cervical cancer is the second most frequent type in this region that has been affecting 5,008 women confirmed annually with cervical cancer and causing 3,197 deaths each year as per reported data. The high prevalence of cervical cancer in Pakistan leads to a large burden, thus necessitating improved prevention and early detection strategies [3, 4]. Cervical cancer represents as a major public health issue in India, with 134420 cases per annum and responsible for 72825 deaths [5]. The World Health Organization WHO recognizes the urgent requirement of simple inexpensive methods for screening and these can be utilized in resource-poor countries to decrease cervical cancer burden globally [6]. There are several methods and one of them is Visual Inspection with Acetic Acid (VIA) which has been recognized as a cost-effective method in low-resources settings [7-9]. This exam consists in the application of acetic acid onto the cervix, temporarily highlighting regions which a priori seem to indicate

DOI: https://doi.org/10.54393/pjhs.v5i12.2494

abnormal areas suggestive for precancerous or cancerous alterations what can actually be visually accessed [10, 11]. The VIA testing involves the application of 3–5% acetic acid to the cervix, which makes premalignant or malignant lesions appear white — these can be seen with a doctor's naked eye [12]. VIA is referred as a primary screen for cervical cancer by the WHO in LMIC and plays an important role to be used with "screen-and-treat" that encourages same day treatment after positive VIA screening, thereby increasing likelihood patient are not lost on follow-up [13]. These assays are especially useful when recognized advanced screening technologies like the Pap smears or HPV DNA testing might not be possible due to financial and logistical issues [14]. Literature have shown that VIA is a cost-effective and very sensitive screening method for cervical lesions to be used as the basis of large-scale monitoring programs in low-resource settings [15]. The challenges facing the proper implementation of this successfully working VIA-based screening program include proper training of healthcare providers, ensuring quality control, and overcoming cultural and other logistical barriers to take up screening [16]. Nevertheless, VIA remains one of the cornerstones of cervical cancer prevention strategies in LMICs, where many countries worldwide integrate it into their national public health programs.

The study was conducted to determine the diagnostic accuracy of VIA in diagnosing cervical cancer as compared to conventional methods.

METHODS

It was a retrospective study on the prevention and control of cervical cancer, with a particular emphasis on the sensitivity of VIA as a screening modality. The study was carried out at the Divisional Headquarters Teaching Hospital, Mirpur, Azad Kashmir, Pakistan after taking ethical approval from Mohtarma Benazir Bhutto Shaheed Medical College Mirpur (Ref.No.66/Academic Block Trauma Center/Surgery). Presumptive diagnosis of cervical cancer by naked eye examination according to guidelines set by the WHO, particularly in low-resource settings where facilities for higher-level screening tests such as Pap smear and testing for HPV were unavailable, was the basis on which the study was performed. The study collected follow up data of females from January 1, 2012, to December 31, 2022, uninterruptedly for a period of ten continuous years. The population included women aged 25-65 years presenting to the hospital for routine cervical cancer screening. These were selected using a non-probability consecutive sampling technique. Cochran formula was used to calculate sample size by taking margin of error (e) 0.05, an estimated proportion of population (p) 0.5, population of 20,000, and Z(a/2) score from the Z table at 95% confidence interval which was 1.96 and 20% drop out rate. The total sample included 1200 women. The inclusion criteria had been the specification of the age stated above and those who had never undergone cervical cancer screening in the last three years. Women with a known history of cervical cancer, previous hysterectomy, or active vaginal infection were excluded from the study. VIA screening was done using the procedure recommended by WHO [17]. During the performance of the procedure, the cervix was swabbed with 3-5% acetic acid, and after one minute, it was observed visually for appearance of the acetowhite lesions that indicate possible precancerous changes or cervical cancer. The screening was performed by trained health professionals who had undergone previous training in VIA. All data were thoroughly screened and cleaned prior to analysis to ensure accuracy. This process included identifying missing data and addressing participants lost to follow-up. To account for potential attrition, a 20% dropout rate was incorporated, ensuring the study sample remained representative of the target population. It was a retrospective collection of data regarding the demographic information (like age, marital status, socio-economic status) VIA screening results, and follow-up diagnostic procedures such as colposcopy and biopsy from the hospital records. These diagnostic procedures, namely colposcopy and biopsy, were also conducted on all cases to further confirm the presence of either CIN or cervical cancer. The main outcome measures were diagnostic precision of VIA, expressed through its sensitivity, specificity, PPV, and NPV regarding precancerous lesions and cervical cancer. Sensitivity was the proportion of true positives-women with histologically confirmed CIN or cancer-out of all women who tested positive on VIA. Specificity was calculated as the proportion of true negatives-women without CIN or cancer-among all women who tested negative on VIA. The PPV was the proportion of true positives among all women testing positive, whereas NPV was the proportion of true negatives among all women testing negative. Data were cleaned, entered, and analyzed using SPSS version 24.0. The chi-square test was conducted to determine the difference in cervical cancer incidence among VIA-positive and VIA-negative groups. Sensitivity, specificity, PPV, and NPV of VIA were computed. The p-values ≤ 0.05 were considered significant. After taking the ethical approval from Institutional Review Board of Divisional Headquarters Teaching Hospital, Mirpur. No patient consent to review the patients' data was required since this study followed a retrospective analysis. However, in order to keep the patient confidentiality, all of the data were anonymized.

RESULTS

Mean age of the women screened was 43.7 ± 8.6 years. The sample consists of 1,200 participants, with 889 (74.2%)

DOI: https://doi.org/10.54393/pjhs.v5i12.2494

being married and 311 (25.8%) not married. Regarding socioeconomic status, the majority of participants were classified as poor, with 665 (55.4%) falling into this category. A smaller proportion of participants had a middle socioeconomic status 348 (29.0%), while 187 (15.5%) participants were classified as having a high socioeconomic status (Table 1).

Table 1: Demographic and Screening Characteristics of VIA Study Sample

Variables	Outcomes Mean ± SD/ N (%)
Age (Years)	43.7 ± 8.6
Marital Status	
Yes	899 (74.1%)
No	311 (25.9%)
Socioeconomic Status*	
Poor	665 (55.4%)
Middle	348 (29.0%)
High	187 (15.5%)

*Socioeconomic status was calculated by individual's monthly household income

The figure 1, compared the diagnostic outcomes of cervical cancer screening using Visual Inspection with Acetic Acid (VIA) and colposcopy. Of the 1,200 women screened by VIA, 280 (23.3%) turned out to be positive for precancerous or cancerous lesions. All patients who tested positive on VIA were subsequently followed up and underwent colposcopy and biopsy for confirmation. VIA detected 23.3% of cases as positive and 76.6 % as negative, while colposcopy identified only 18.10% of cases as positive and 81.90% as negative. This suggests a significant discrepancy between the two methods, with VIA identifying a higher proportion of positive cases, potentially indicating its higher sensitivity compared to colposcopy (Figure1).

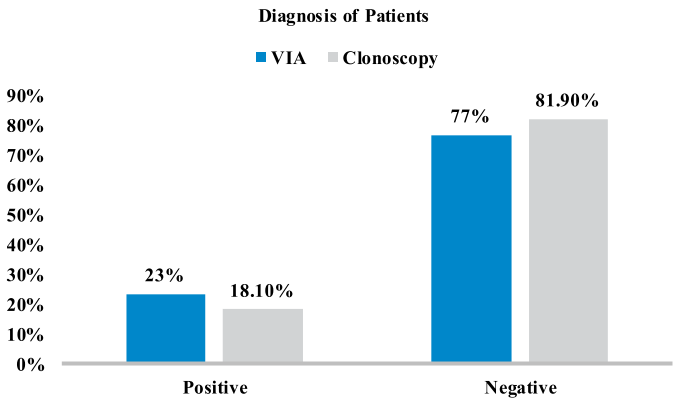

Figure 1: Diagnostic Outcomes of Cervical Cancer Screening using Visual Inspection with Acetic Acid (VIA) and Colposcopy

Among 1,200 women screened for cervical abnormalities using VIA, 280 tested positive (23.3%). The proportion of VIA-positive cases increased with age, with the highest number of positives (112) in the 45-54 age group, followed by 70 in the 35-44 age group. Notably, despite screening fewer women in the 55-65 age group, 50 VIA positives were identified, suggesting a higher prevalence of abnormalities in older women. The number of biopsies conducted closely followed the VIA-positive results. The 35-44 and 45-54 age groups had a high rate of follow-up biopsies (68 and 77, respectively), with nearly all VIA-positive women in these groups undergoing further evaluation. In contrast, the 25-34 and 55-65 age groups had lower biopsy rates (38 and 35, respectively), though still proportionally significant. These findings indicate that the VIA screening method identified a substantial number of potential abnormalities across all age groups, with follow-up biopsies further confirming the need for medical evaluation, particularly among women aged 35-54 (Table 2).

Table 2: Comparison of Age Group with VIA Positivity, and Colposcopy-Guided Biopsy Results

Age Group (Years)	Women Screened	VIA Positives N (%)	Colposcopy-Guided Biopsies N (%)	p-Value
25-34	300	48 (17.1%)	38 (17.4%)	0.000
35-44	400	70 (25.0%)	68 (31.1%)	
45-54	350	112 (40.0%)	77 (35.3%)	
55-65	150	50 (17.8%)	35 (16.0%)	
Total	1200	280	218	

From 2012 to 2022, there was general trend showing fluctuation in both screening and confirmed cases. Notably, the year 2017 recorded the highest number of both VIA positive (45) and colonoscopy positive (37) results. Similarly, 2016, 2018, and 2020 had relatively higher numbers of both metrics, indicating increased detection or participation in those years. Conversely, the lowest figures were observed in 2022, where VIA positive cases dropped to 12, with colonoscopy-confirmed positives at just 7. This decreasing trend in the last two years (2021 and 2022) may indicate reduced screening or fewer confirmed cases. (Figure 2).

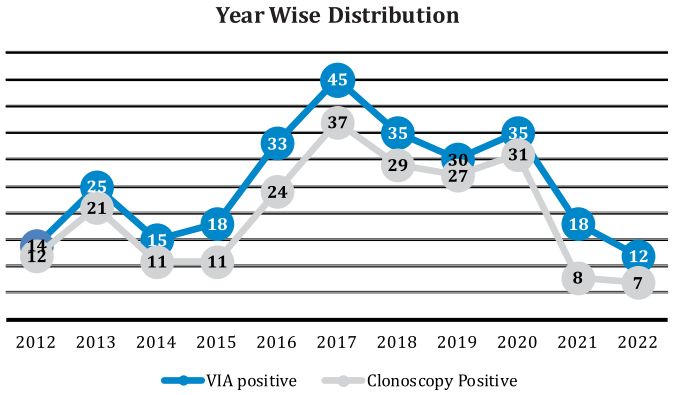

Figure 2: Year-wise distribution of positive cases

Out of the 1200 women screened, 280had a positive result on VIA, with 218 of those confirmed as true positives by

DOI: https://doi.org/10.54393/pjhs.v5i12.2494

biopsy, and 62 classified as false positives. In contrast, 920 women had a negative result on VIA, of which 844 were true negatives confirmed by biopsy, and 36 were false negatives. The diagnostic accuracy of VIA for cervical abnormalities shows high sensitivity (85.8%) and specificity (93.4%). VIA's positive predictive value was 77.8%, while the negative predictive value was 96.1%, indicating reliable detection of true positives and negatives (Table 3).

Table 3: Diagnostic Accuracy of VIA and Colonoscopy Guided Biopsy

Variables	Result
Total Women Screened	1,200
VIA Positive Cases	280
True Positives (confirmed by biopsy)	218
False Positives	62
VIA Negative Cases	920
True Negatives (confirmed by biopsy)	844
False Negatives	36
Diagnostic Accuracy Metrics	
Sensitivity	85.8%
Specificity	93.4%
Positive Predictive Value (PPV)	77.8%
Negative Predictive Value (NPV)	96.1%

DISCUSSION

The present study has furnished useful information regarding the performance of VIA as a screening modality for cervical cancer, especially in resource-poor environments. It was observed that VIA may be a good detection method for precancerous and cancerous lesions as it showed sensitivity (89.34%) and specificity (96.23%). These findings suggest that VIA represents a good initial screening method when facilities for Pap smears or HPV testing were not available due to resource constraints. Recent studies confirm the utility of VIA in screening, demonstrating its high accuracy and cost-effectiveness, with added value coming from new techniques like artificial intelligence enhancing detection [18]. The results of current study were supported by the literature available on cervical cancer screening in developing countries. One study reported the usefulness of VIA as a low-cost and easily implementable approach for early detection of cervical lesions, especially in areas where cytological screening approaches were not available [19]. In current study it was demonstrated that however VIA detected 23.3% of cases as positive and 76.6 % as negative. However, these findings were comparable with a cohort study which reported that the true positive rate by VIA was 21% and false positive as 5%. These trends show that the VIA was reliable and cost-effective tool for the detection of cervical cancer in low resource settings [20]. Moreover, positive predictive value was 85.83%, while the negative predictive value was 97.25%. Showed further assurance that VIA was reliable in correctly identifying those women who need further diagnostic evaluation, such as colposcopy and biopsy. These findings agree with other studies also reporting similarly high diagnostic validity for VIA in ruling out, as well as in detecting, precancerous lesions. Another study that was conducted found that positive predictive value, negative predictive value and diagnostic accuracy of Pap smear in diagnosis of cervical carcinoma were 84.15%, 81.94% and 83.12% respectively. The study finally concluded that VIA has a greater sensitivity and accuracy than that of Pap smear [21]. The age distribution of the confirmed lesions in the study showed that from the age group 45-65 years, the incidence of cervical lesions was higher compared to the age group 25-44 years. This agrees with other studies reporting increased risk of cervical cancer in older women probably due to accumulation of exposure to risk factors over time [22]. The strong association of age with the diagnosis of lesions, represented by a p-value of less than 0.05, points out that targeted screening strategies should be prioritized for older women because the risk of cervical cancer increases with age. A systematic review of VIA found a sensitivity of 71.8%, specificity of 79.4%, positive predictive value of 16.7%, and negative predictive value of 99.0%. According to a study, VIA was more sensitive than Pap smear and was also easy, safe, cheap and needs little training making it possible for primary health care workers to perform. Owing to its high sensitivity and NPV, VIA was suggested as an effective substitute for screening women with precancerous cervical lesions. As compared to conventional cytology, VIA has the superior sensitivity and NPV, qualities that will make it a reliable and appropriate cervical cancer screening method especially in resource-poor countries [23]. However, this study has limitations also, the main limitation the type of study design, which was retrospective in nature which leads selection bias in the samples if data from hospital records were solely depended on, and a nonrandomized form of sampling may weaken the generalization of results. The study did not take into consideration the variation that may occur due to differences in skill levels among health providers performing VIA. Another limitation of the study was to comparing the results of VIA and colposcopy guided biopsy. However, we consider it necessary to mention that other screening methods, including HPV testing and Pap smear, must be addressed in future studies for more in-depth evaluation of screening techniques. The study had these limitations, yet it offers extensive evidence for the application of VIA as a screening tool in resource-constrained settings.

DOI: https://doi.org/10.54393/pjhs.v5i12.2494

CONCLUSIONS

This investigation demonstrated that VIA was a valid method of detection of precancerous and cancerous lesions with considerable diagnostic accuracy, especially in resource-poor settings. There was a higher incidence of cervical lesions in women aged between 45 to 65 years, indicating the necessity of targeted screening in older women. The study thus supports VIA to continue being used in cervical cancer prevention strategies, despite its limitations, to supplement the lack of advanced screening technologies in these areas.

Authors Contribution

Conceptualization: SR, SS, NH
Methodology: MSK, AF, SA, SS
Formal analysis: SS
Writing, review and editing: MSK, AF, NH

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] Hull R, Mbele M, Makhafola T, Hicks C, Wang SM, Reis RM, Mehrotra R, Mkhize-Kwitshana Z, Kibiki G, Bates DO, Dlamini Z.Cervical cancer in low and middle-income countries. Oncology letters. 2020 Sep 1;20(3):2058-74.

[2] Parham GP, Mwanahamuntu MH, Kapambwe S, Muwonge R, Bateman AC, Blevins M *et al*. Population-level scale-up of cervical cancer prevention services in a low-resource setting: development, implementation, and evaluation of the cervical cancer prevention program in Zambia. PLOS One.2015 Apr; 10(4): e0122169. doi: 10.1371/journal.pone.0122169.

[3] Awan UA and Khattak AA. Has Pakistan failed to roll back HPV?.The Lancet Oncology.2022 May; 23(5): e204. doi: 10.1016/S1470-2045(22)00141-3.

[4] Chughtai N, Perveen K, Gillani SR, Abbas A, Chunara R, Manji AA, Karani S, Noorali AA, Zakaria M, Shamsi U, Chishti U. National cervical cancer burden estimation through systematic review and analysis of publicly available data in Pakistan. BMC public health. 2023 May 5;23(1):834.

[5] Wright Jr TC and Kuhn L. Alternative approaches to cervical cancer screening for developing countries. Best Practice & Research Clinical Obstetrics & Gynaecology. 2012 Apr; 26(2): 197-208. doi: 10.1016/j.bpobgyn.2011.11.004.

[6] World Health Organization. Strategic framework for the comprehensive prevention and control of cervical cancer in the Western Pacific Region 2023-2030.

[7] Denny L, Saidu R, Boa R, Mbatani N, Castor D, Moodley J *et al*. Point-of-care testing with Xpert HPV for single-visit, screen-and-treat for cervical cancer prevention: a demonstration study in South Africa. Scientific Reports.2023 Sep; 13(1): 16182. doi: 10.1038/s41598-023-43467-2.

[8] Poli UR, Bidinger PD, Gowrishankar S. Visual inspection with acetic acid (via) screening program: 7 years experience in early detection of cervical cancer and pre-cancers in rural South India. Indian Journal of Community Medicine. 2015 Jul; 40(3): 203-7. doi: 10.4103/0970-0218.158873.

[9] Mustafa MS, Jindal AK, Singh PM. Visual inspection using acetic acid for cervical cancer in low resource settings. Medical Journal Armed Forces India. 2010 Oct 1;66(4):382-4.

[10] Laxmi M, Reddy SS. Cervical Cancer Screening by Simple Visual Inspection After Acetic Acid. International journal of health sciences.;6(S4):9371-8.

[11] Rajpar SA, Memon FA, Munawar RA. Visual Inspection of the Cervix with Acetic Acid for Screening of Cervical Cancers. Pak J Med Health Sci. 2021;15(1):516-9.

[12] Sankaranarayanan R, Wesley RS, World Health Organization. A practical manual on visual screening for cervical neoplasia. 2003.

[13] Chamot E, Kristensen S, Stringer JS, Mwanahamuntu MH. Are treatments for cervical precancerous lesions in less-developed countries safe enough to promote scaling-up of cervical screening programs? A Systematic Review. BioMed Central Women's Health. 2010 Dec; 10: 1-1. doi: 10.1186/1472-6874-10-11.

[14] Rajaram S and Gupta B. Screening for cervical cancer: Choices & dilemmas. Indian Journal of Medical Research. 2021 Aug; 154(2): 210-20. doi: 10.4103/ijmr.IJMR_857_20.

[15] Taha T, Yousuf S, Rehmani D. Direct Visual Inspection with Acetic Acid: A Cost-Effective Test for Cervical Cancer Screening. Pakistan Journal of Medicine and Dentistry. 2021 Apr-Jun; 10(2): 36-42. doi: 10.36283/PJMD10-2/007.

[16] Cubie HA, Campbell C. Cervical cancer screening–the challenges of complete pathways of care in low-income countries: focus on Malawi. Women's Health. 2020 May;16:1745506520914804.

[17] World Health Organization. New recommendations for screening and treatment to prevent cervical cancer.(2021)[Internet]. 2023

[18] Vinals R, Jonnalagedda M, Petignat P, Thiran JP,

DOI: https://doi.org/10.54393/pjhs.v5i12.2494

Vassilakos P. Artificial intelligence-based cervical cancer screening on images taken during visual inspection with acetic acid:A systematic review. Diagnostics. 2023 Feb; 13(5): 836. doi: 10.3390/diagnostics13050836.

[19] Malabadi RB, Sadiya MR, Prathima TC, Kolkar KP, Mammadova SS, Chalannavar RK.Cannabis sativa: Cervical cancer treatment-Role of phytocannabinoids-A story of concern. World Journal of Biology Pharmacy and Health Sciences. 2024 Feb; 17(2): 253-96. doi: 10.30574/wjbphs.2024.17.2.0076.

[20] Shastri SS, Mittra I, Mishra G, Gupta S, Dikshit R, Badwe RA. Effect of visual inspection with acetic acid (VIA) screening by primary health workers on cervical cancer mortality: A cluster randomized controlled trial in Mumbai, India. 2014 Feb; 106(3): dju009. doi: 10.1093/jnci/dju009.

[21] Adnan Z, Khan AA, Nayyar S, Nayyar A, Anwar Z, Ahsan S. Diagnostic Accuracy of Visual Inspection with Acetic Acid (VIA) and PAP Smear in Diagnosing Cervical Cancer, Taking Histopathology as Gold Standard. Journal of the Society of Obstetricians and Gynaecologists of Pakistan. 2021 Apr; 11(1): 36-40.

[22] Huy NV, Tram NV, Thuan DC, Vinh TQ, Thanh CN, Chuang L. The value of visual inspection with acetic acid and Pap smear in cervical cancer screening program in low resource settings-A population-based study. Gynecologic Oncology Reports. 2018 May; 24: 18-20. doi: 10.1016/j.gore.2018.02.004.

[23] Ameena L. Comparative Study of Pap Smear Verses Visual Inspection with Acetic Acid in Screening for Cervical Cancer. Indian Journal of Public Health Research & Development. 2021 May; 12(3): 106-14. doi: 10.37506/ijphrd.v12i3.16050.